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*Indian Standard*  
SPECIFICATION FOR  
BALL, PEBBLE AND TUBE MILLS

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# Indian Standard

## SPECIFICATION FOR

### BALL, PEBBLE AND TUBE MILLS

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# *Indian Standard*

## SPECIFICATION FOR BALL, PEBBLE AND TUBE MILLS

### 0. FOREWORD

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 23 May 1968, after the draft finalized by the Chemical Engineering Sectional Committee had been approved by the Mechanical Engineering Division Council.

**0.2** These mills have a cylindrical or a conical shell rotating on a horizontal axis and are charged with suitable grinding media. The milling action is produced between the input material to be ground and the grinding media by impact and friction. Tumbling mills, as these are generally called are simple to operate and versatile in use.

**0.3** Particulars regarding information to be given to the manufacturer by the purchaser with enquiry or order and by the manufacturer along with the quotation and supply are given in Appendices A and B respectively.

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### 1. SCOPE

**1.1** This standard covers ball and tube mills used for fine grinding.

### 2. TERMINOLOGY

**2.0** For the purpose of this standard, the following definitions shall apply.

**2.1 Ball Mill** — A tumbling mill which uses metallic balls or pebbles or large pieces of material as grinding media. The length of shell is usually less than twice the nominal diameter.

**2.2 Tube Mill** — A tumbling mill which uses metallic balls or pebbles or large pieces of material as grinding media. The length of shell is usually more than twice the nominal diameter and there are generally two or more compartments.

### 3. NOMENCLATURE

**3.1** The various components of tube mill and ball mill shall be designated as in Fig. 1, 2 and 3.

## 4. CLASSIFICATION

**4.1** The ball and tube mills may be classified as:

- a) batch mills, and
- b) continuous mills.

In a batch mill the charge to be ground is loaded into the mill in a batch and after grinding is removed in a batch, whereas in a continuous mill, continuous supply and removal of material is maintained.

**4.1.1** The continuous mills are further classified as:

- a) grate discharge mills,
- b) trunnion overflow mills, and
- c) air-swept mills.

**4.1.1.1** *Grate discharge mill* — A mill in which a diaphragm in the form of a grating confines the ball charge to one end of the mill and the space between the diaphragm.

The material is either discharged by a scoop between the grate and discharge end or through peripheral ports.

**4.1.1.2** *Trunnion overflow mill* — A mill in which material overflows at the discharge end.

**4.1.1.3** *Air-swept mill* — A mill in which a powerful stream of air is passed through the mill to remove finer particles produced by grinding process

**4.2** Ball mills are further classified as:

- a) cylindrical ball mills in which shell is entirely cylindrical,
- b) conical ball mills in which only short section of shell is truly cylindrical while feed and discharge ends are truncated cones of varying inclinations, and
- c) triconical ball mills in which ends as well as shells are all conical or of different inclinations.

**4.3** Tube mills are further classified as multi-compartment or single compartment.

## 5. SIZES

**5.1** Sizes of machine shall be denoted by internal nominal diameter and length of shell in metres.

## 6. DESIGNATION

**6.1** The designation of a ball or tube mill shall include:

- a) commonly used name,
- b) classification,
- c) size designation, and
- d) number of this standard.

*Example:*

A cylindrical air-swept ball mill with an inside diameter of 1·6 m and 4 m long will be designated as:

Air Swept Ball Mill 1·6 × 4·00 IS : 4642

## 7. MARKING

**7.1** Each mill shall have a suitably affixed metal plate on the body carrying the following data in legible form:

- a) Name and address of the manufacturer,
- b) Serial number of the machine,
- c) Size,
- d) Capacity,
- e) Power consumption, and
- f) Speed.

**7.1.1** Any other information, as mutually agreed upon between the purchaser and the manufacturer, shall be given on a separate name plate.

## 8. SUPPLY

**8.1** The manufacturer shall supply a certificate to the purchaser along with each machine certifying that the mill has been inspected for freedom from visible defects and the mill has satisfactorily withstood the trial run. Items to be covered under this certificate are given in Appendix C.

## A P P E N D I X A ( Clause 0.3 )

### INFORMATION TO BE SUPPLIED BY THE PURCHASER TO THE MANUFACTURER WITH THE ENQUIRY AND ORDER

**A-1.** When enquiring or ordering tumbling mills to this specification, the user shall furnish information to the supplier on the following:

- a) Place of installation;

- b) Object of reduction;
- c) Material handled:
  - 1) Type of material,
  - 2) Moisture percentage,
  - 3) Density,
  - 4) Hardness of material,
  - 5) Size of feed and percentage of finished product size in it,
  - 6) Size of product required and percent oversize permitted, and
  - 7) Quantity to be handled per 24 hours with continuous working of the machine;
- d) Power available, that is, supply voltage and phase; and
- e) Any other requirements or limitations imposed.

## APPENDIX B

*(Clause 0.3)*

### **INFORMATION TO BE FURNISHED BY THE MANUFACTURER TO THE PURCHASER ALONG WITH QUOTATION AND SUPPLY**

**B-1.** When offering tumbling mills to this specification, the manufacturer shall furnish to the purchaser information on the following:

- a) Classification of the machine;
- b) Materials of the following major components of the machine:
  - 1) Shell,
  - 2) Flange ring,
  - 3) Head,
  - 4) Trunnions,
  - 5) Trunnion rings,
  - 6) Gears,
  - 7) Pinions,
  - 8) Shell liners, and
  - 9) End liners;

- c) Grinding media, that is, material, shape and size, tonnage;
- d) Capacity in tonnes per 24 hours in terms of material of density  $1\cdot6 \text{ g/cm}^3$ ;
- e) Operating speed;
- f) Power required to drive the machine;
- g) Type of drive;
- h) Method of drive; and
- j) Ratio of starting torque to running motor torque;

## **A P P E N D I X C**

*( Clause 8.1 )*

### **INFORMATION TO BE GIVEN IN THE CERTIFICATE BY THE MANUFACTURER TO THE PURCHASER AT THE TIME OF SUPPLY OF THE MACHINE**

#### **C-1. INSPECTION**

**C-1.1** The inspection report shall state that each part of the mill has been inspected before painting to ensure that it is free from any visible defects in casting, machining, etc.

#### **C-2. TEST RUN**

**C-2.1** The test run shall state:

- a) the number of hours ( minimum 4 hours ) the mill has been run continuously under no load after completion of the assembly and the mill has been inspected to ascertain that:
  - 1) the construction of the mill is satisfactory,
  - 2) no undue vibration is noticed during the run,
  - 3) the lubricating condition is satisfactory,
  - 4) the temperature rise in the case of each bearing does not exceed  $20^\circ\text{C}$ ; and
- b) that after dismantling the mill after the trial run inspection has been carried out to ensure that there is no slackness or unusual wear on any component and that the bearings are evenly loaded.

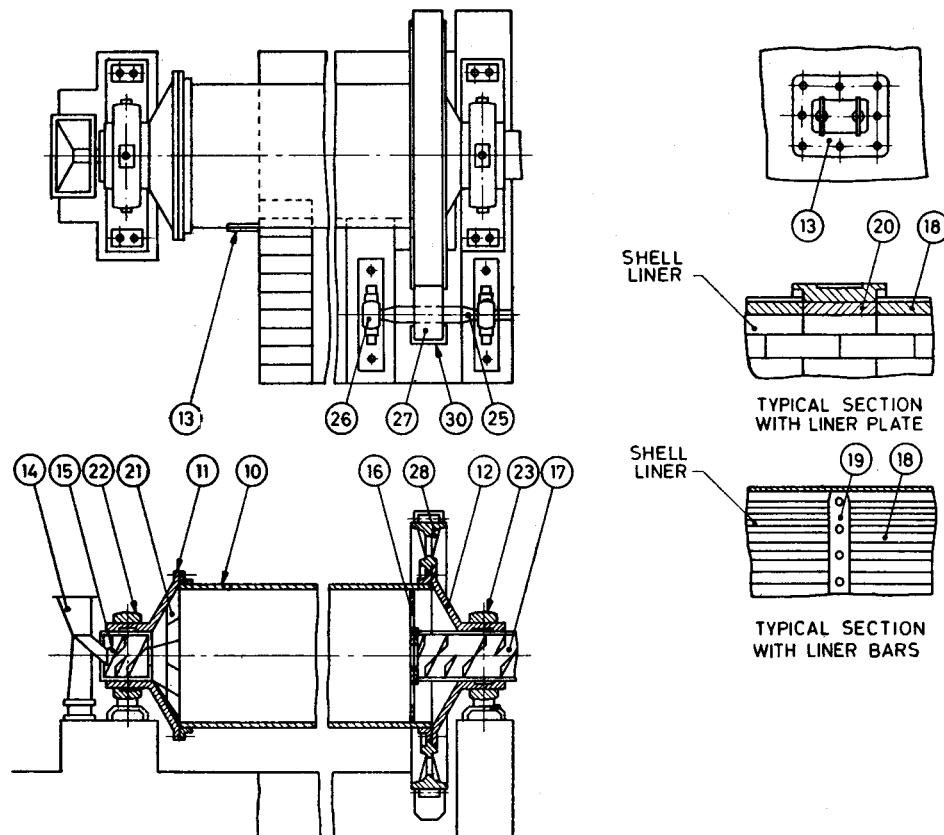


FIG. 1 NOMENCLATURE OF BALL AND SINGLE-COMPARTMENT TUBE MILL

No.	Nomenclature
1*	Shell assembly
2*	Feed assembly
3*	Discharge assembly
4*	Shell lining
5*	Trunnion bearing
6*	Drive assembly
7*	Guard assembly
10	Shell
11	Feed head
12	Discharge head
13	Manhole assembly
14	Feed hopper
15	Feed trunnion liner
16	Discharge grate
17	Discharge trunnion liner
18	Liner plates or liner bars
19	Segments of ring
20	Manhole liner plate
21	Feed liner
22	Feed trunnion bearing
23	Discharge trunnion bearing
24*	Coupling
25	Pinion shaft
26	Pinion shaft bearing
27	Pinion
28	Ring or girth gear
29*	Coupling guard
30	Gear guard

\*Not shown.

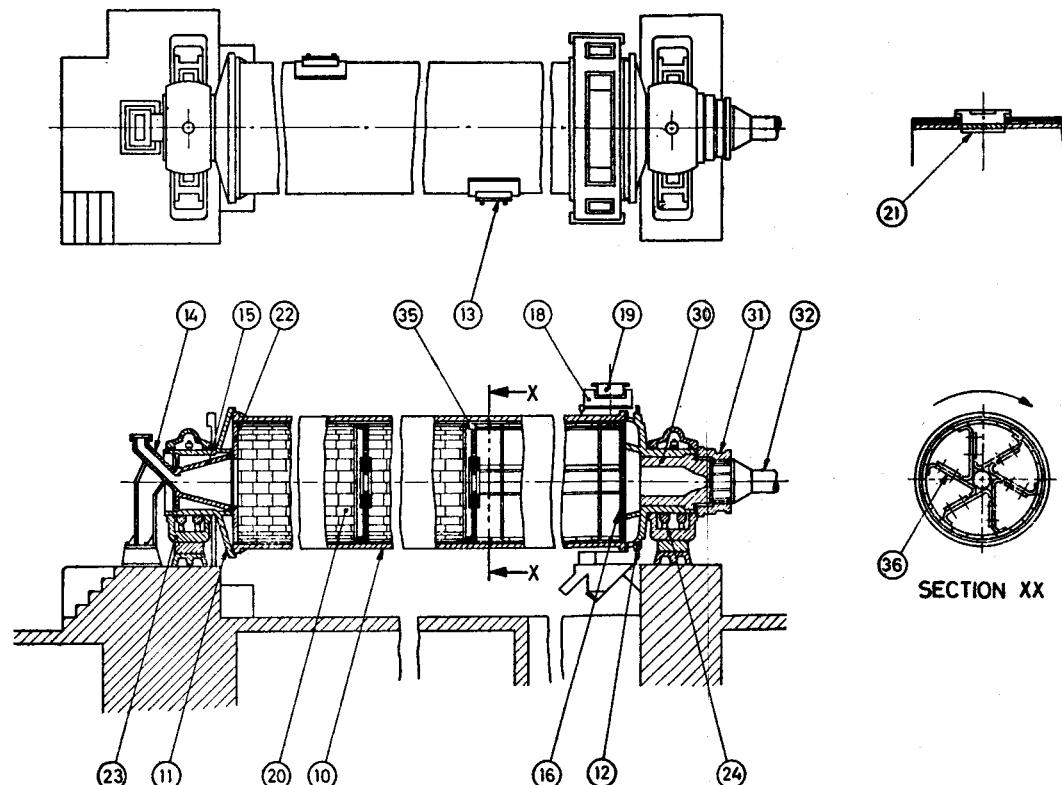


FIG. 2 NOMENCLATURE OF MULTI-COMPARTMENT TUBE MILL

No.	Nomenclature
1*	Shell assembly
2*	Feed assembly
3*	Discharge assembly
4*	Shell lining
5*	Trunnion bearing
6*	Drive assembly
7*	Guard assembly
8*	Mounting assembly
10	Shell of tube mill
11	Feed head
12	Discharge head
13	Manhole assembly
14	Feed hopper
15	Feed trunnion liner
16	Discharge grate
17†	Discharge trunnion liner
18	Trommel screen
19	Discharge box
20	Liner plates
21	Manhole liner plate
22	Feed liner
23	Feed trunnion bearing
24	Discharge trunnion bearing
25†	Coupling
26†	Pinion shaft
27†	Pinion shaft bearing
28†	Pinion
29†	Ring or girth gear
30	Wobbler
31	Coupling housing
32	Drive shaft
33†	Coupling guard
34†	Gear guard
35	Partition diaphragm
36	Concentra-type mounting

\*Not shown.

†Alternative section with smaller construction features not shown.

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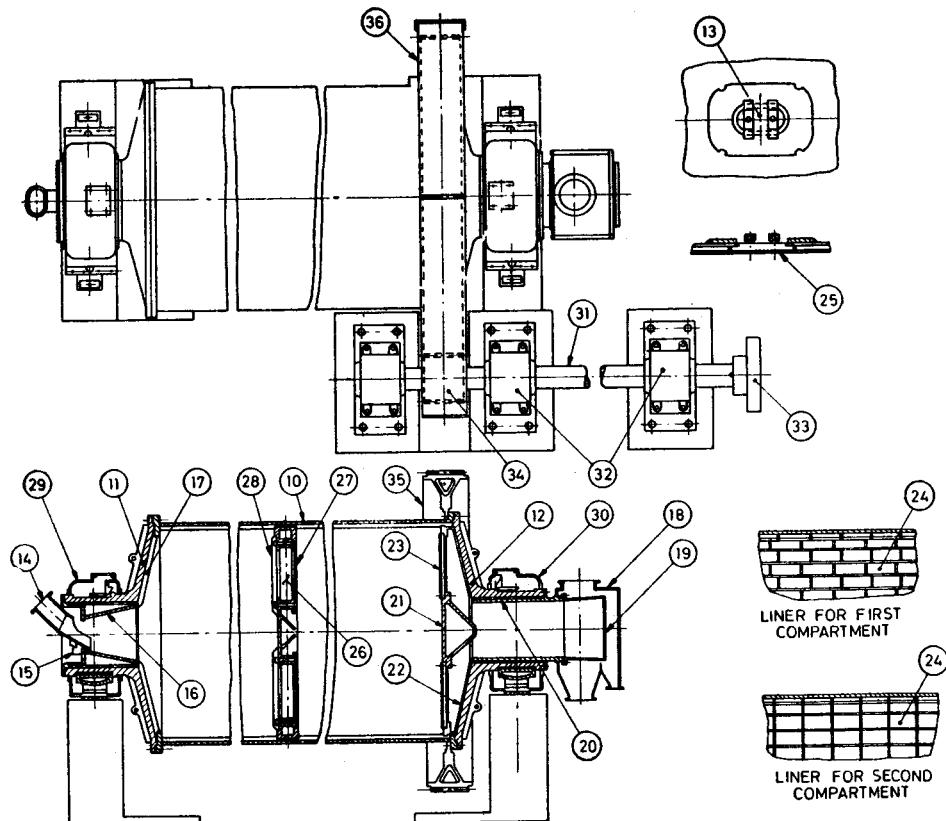


FIG. 3 NOMENCLATURE OF MULTI-COMPARTMENT TUBE MILL  
(GRATE DISCHARGE TYPE)

No.	Nomenclature
1*	Shell assembly
2*	Feed head assembly
3*	Discharge head assembly
4*	Shell liners
5*	Diaphragm assembly
6*	Main trunnion bearing assembly
7*	Drive assembly
8*	Gear guard assembly
10	Shell
11	Feed head
12	Discharge head
13	Manhole assembly
14	Feed hopper
15	Lifter ring
16	Feed head trunnion liner
17	Feed head liner
18	Discharge housing
19	Discharge screen
20	Discharge head trunnion liner
21	Centre cone
22	Discharge head liner
23	Discharge grate segment
24	Shell liner
25	Manhole liner
26	Diaphragm centre
27	Diaphragm liners
28	Diaphragm grate segment
29	Feed head trunnion bearing
30	Discharge head trunnion bearing
31	Counter shaft
32	Counter shaft bearing
33	Coupling
34	Pinion
35	Girth gear
36	Gear guard

\*Not shown.

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